

## CHAPTER 6

### Water Resource Development Projects

Florida water law identifies two types of projects to meet water needs: Water Resource Development projects and Water Supply Development projects. Water Resource Development projects are generally the responsibility of a water management district, and are intended to assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial to maintain the functions of natural systems. Water Supply Development projects are generally the responsibility of local users, such as utilities, and involve the water source development options described in **Chapter 5** to provide water to users.

This chapter addresses the role of the South Florida Water Management District (SFWMD or District) and other parties in Water Resource Development projects, and provides a summary of the Water Resource Development projects in the Lower West Coast (LWC) Planning Area, including schedules and costs for Fiscal Years 2006–2010. Water Supply Development projects are addressed in **Chapter 7**.

Water resource development is defined in Section 373.019(22), Florida Statutes (F.S.), as the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities.

Water Resource Development projects support and enhance Water Supply Development projects, but often by themselves do not yield specific quantities of water. For example, hydrologic investigations and groundwater monitoring and modeling provide important information on aquifer characteristics, such as hydraulic properties and water quality. All of these efforts are useful in developing an appropriate facility design, identifying the safe yield and evaluating the economic viability of Water Supply Development projects. The Water Resource Development projects described in this chapter—drilling and testing, groundwater and wetland monitoring, groundwater and evapotranspiration assessments, Districtwide feasibility studies, minimum flows and levels, and reservations—do not produce water, but serve an important role in supporting the Water Supply Development projects described in the next chapter. The Water Conservation Program, which makes water available, is discussed in this chapter, and encourages measures to use water more efficiently so the water saved can be used to meet new needs. In effect, conservation expands current water supplies.

The following water resource efforts are organized according to the current budget categories the District uses for funding both new and ongoing Water Resource Development projects. The status of these projects and identification of implementing entities are included in project discussions.

**Table 7** at the end of the chapter summarizes the estimated costs and time frames for completion of these projects. The District's Water Resource Development projects presented in this chapter encompass more than one region and are therefore considered Districtwide. Aspects of these Districtwide projects specifically pertaining to the LWC Planning Area are identified.

## DRILLING AND TESTING PROGRAM

A Districtwide Drilling and Testing Program is providing an improved understanding of the geology and hydrology of the aquifers in south Florida as new exploratory/test wells are constructed during the next five years. Efforts will continue to evaluate conditions in the Floridan Aquifer System (FAS) as a brackish water supply source for the LWC Planning Area, and well construction activities at each site are yielding additional information on the aquifers and confining units above the FAS. These efforts will develop a more complete understanding of the hydrology and potential yields of the aquifer system, as well as support consumptive use permitting (CUP) and water supply development efforts.

## GROUNDWATER AND WETLAND MONITORING

Well construction and monitoring efforts provide information on geology, aquifer characteristics and water level conditions to aid the SFWMD in the development of groundwater models, assessing groundwater conditions and management of this resource. Aquifer monitoring is an ongoing effort.

### Groundwater Monitoring

Groundwater level and water quality monitoring in the LWC Planning Area was expanded between 2000 and 2005. Ongoing monitoring efforts continued in the Surficial Aquifer System (SAS) and Intermediate Aquifer System (IAS), and an additional 23 recorders were installed on SAS wells in Hendry County to evaluate local water level trends. The FAS network was expanded to 12 sites within the LWC Planning Area. Continuous water-level recorders have been installed at these sites, and periodic water quality assessments are available.

## **Wetlands Monitoring Network**

Wetlands serve a vital role in providing habitat for many species of plants and animals. Within the SFWMD, consumptive uses, drainage or other diversions of water may impact the hydrologic system supporting these wetlands. To better understand these systems, the District has expanded its network of wetland monitoring sites Districtwide.

## **GROUNDWATER AND EVAPOTRANSPIRATION ASSESSMENTS**

A number of specialized hydrogeologic studies were completed by the U.S. Geological Survey (USGS) in cooperation with the District. The information learned from these studies is needed to enhance the understanding of aquifers and evapotranspiration (ET) rates across the District. Typically, each project requires several years of focused effort by the USGS professionals, giving a continuity and focus unique to the USGS. Some projects have the cooperation of other water management districts or other governmental agencies. The USGS reports, maps and data are peer reviewed and highly respected in the industry, making them invaluable references for District groundwater models, assessments and policy-making.

Current USGS projects include development of a water quality module for a new District model and a project to measure ET in five specific vegetation communities that occur throughout the District. In addition, a study of the salinity patterns and sediment runoff in Estero Bay is being conducted in the LWC Planning Area.

## **COMPREHENSIVE WATER CONSERVATION PROGRAM**

The SFWMD's overall water conservation goal is to prevent and reduce wasteful, uneconomical, impractical or unreasonable uses of water resources. In addition to improving efficiency of water use, the statewide Water Conservation Program, known as "Conserve Florida," strives to improve management of traditional supplies and encourage development of alternative or diverse water supply sources. To better promote the conservation goal, the SFWMD funds outreach and educational programs to encourage water users to make efficient use of water resources through conservation and reuse.

Through the Water Savings Incentive Program (WaterSIP), the SFWMD provides matching funds up to \$50,000 to water providers, such as utilities and homeowners associations, for water-saving technologies. These technologies include low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices and other hardware. During Fiscal Years 2002–2006, 41 projects were funded Districtwide and cumulatively made 2.5 MGD of water available. For Fiscal Year 2007, 14 projects are proposed for funding and are anticipated to make 0.9 MGD of water available. Based on the actual and proposed water savings for Fiscal Years 2002–2007, it is anticipated that a cumulative

total of 3.4 MGD of water will be made available Districtwide. Since the program's inception in 2002 through 2011, it is estimated that 4.25 MGD of water will be made available by WaterSIP.

The Mobile Irrigation Laboratory (MIL) Program consists of specialized labs on wheels designed to conduct irrigation audits of agricultural and urban irrigation systems. The MILs are operated by the Soil and Water Conservation Districts and provide recommendations to water users who implement the water savings recommendations. It is anticipated the MIL Program will make a cumulative total of 10 MGD available Districtwide between Fiscal Years 2007–2011. Since the program's inception in 1998 through 2007, it is estimated that 106 MGD of water has been made available by this program.



Mobile Irrigation Lab Program

Districtwide, there are 15 MILs serving 12 counties. Ten MILs are District-funded and five are funded by other sources. In the LWC Planning Area, there are five MILs, three of which are funded by the District. These include an urban lab in Collier County, an urban lab in Lee County, and an agricultural lab that provides evaluations in Collier, Lee, Hendry, Glades and Charlotte counties. See **Appendix I: Conservation** for more information about the MIL Program in the LWC Planning Area.

Rulemaking efforts are under way at the SFWMD to consider goal-based conservation as a permit condition. Workshops are being held concerning revisions to Chapter 40E-2, Florida Administrative Code (F.A.C.), and the *Basis of Review for Water Use Permit Applications* (SFWMD 2003) that would require individual water utilities to develop goal-based conservation programs. Goal-based conservation allows utilities to achieve a water management district agreed-upon conservation goal, such as a reduction in per capita or overall reduction in pumpage, using any method from a suite of methods the utility chooses, to satisfy CUP conservation requirements.

## FEASIBILITY STUDIES

The SFWMD is performing feasibility studies to determine the viability of water resource development options in order to increase water supply through water resource alternatives. This effort involves collecting and analyzing data and modeling.

## Water User and Supply Cost Relationships Feasibility Study

The objective of the Water User and Supply Cost Relationships Project is to develop engineering cost estimation relationships for evaluating water supply alternatives for the SFWMD's four planning regions. This effort will include options using groundwater, surface water, seawater, aquifer storage and recovery (ASR), and reclaimed water for reuse.

## Co-Located Desalination Feasibility Study

As discussed in **Chapter 5**, saltwater desalination is a potential alternative source meriting future consideration. Seawater has been identified as a significant drought-proof and available resource. Recommended technologies for use or further study in the treatment of brackish water or seawater include reverse osmosis (RO). Advances in membrane technologies have substantially reduced the cost of RO treatment, creating recent interest in the implementation of RO in the coastal United States, including Florida, Texas and California. The 25-MGD Tampa Bay Water RO plant, co-located with the Tampa Electric Company's Big Bend power plant, is expected to start producing water by December 2006. In California, the City of San Diego is implementing a 50-MGD co-located seawater RO facility in Carlsbad, based on the results of its successful demonstration project.



Desalination Plant

To demonstrate the feasibility of coastal water desalination and the benefits of co-locating large desalination plants with existing power plants in south Florida, the current study builds on the results obtained from the 2002 Desalination Feasibility Study. The study area will be streamlined to a small number of site-specific demonstration projects throughout the District, and final site selection will be based on the availability of willing partners, future water demand, and technical, regulatory and economic criteria. The study, which will be completed in October 2006, is expected to recommend specific demonstration projects and provide conceptual designs.

## MODELING

The SFWMD funds modeling efforts supporting the establishment of minimum flows and levels (MFLs), water reservations and projects in the District's four regional planning areas.

## Modeling for Minimum Flows and Levels

Minimum flows and levels are being developed pursuant to the requirements contained within the Water Resources Act and Sections 373.042 and 373.0421, F.S., as part of a comprehensive water resources management approach to assure the sustainability of south Florida's water resources. As part of the MFL process, the SFWMD develops models to assist in determining the hydrologic relationships between MFL criteria and the water resources that need to be protected from significant harm.

## Modeling for Regional Irrigation Distribution System (RIDS)

A recommendation of the 2000 LWC Plan included conducting a feasibility and design study for a regional irrigation water distribution system (RIDS) to help meet the growing urban irrigation demands of the LWC Planning Area. Reclaimed water was to be used where available to serve the irrigation distribution systems. The RIDS Study was completed in 2004, and implementation began in 2005 with the District providing \$500,000.

The RIDS Project is now funded through the SFWMD's Alternative Water Supply Program, and projects are managed by local governments and utilities. The District's role is analysis, oversight and intergovernmental coordination, which potentially includes modeling efforts. The expected completion of RIDS is 2020. **Appendix G** provides more detailed information on the analyses and implementation of RIDS.

## Surficial and Intermediate Aquifers Model Development

In 2001, based on the recommendations in the 2000 LWC Plan, the District began development of regional groundwater models for the SAS, IAS and FAS in the LWC Planning Area. This ongoing effort involves the implementation of two new groundwater models: one for the SAS, including the water table, Lower Tamiami and Sandstone aquifers, and another for the IAS and FAS. Both models include finer grid resolution than previous regional efforts and the most current geologic, hydrologic and pumping data.

The SAS Model is a groundwater flow model developed using the USGS MODFLOW Program. The SAS Model implementation is being conducted by a private engineering firm under contract to the District. The FAS modeling is being conducted using the SEAWAT Program, which simulates variable density flow and transport conditions. The FAS Model is a joint effort between the District and Florida Atlantic University.

Due to time constraints imposed upon the water supply plan schedules from the adoption of state growth-management legislation in late 2005, the modeling efforts are on a parallel, but separate path from the production of the five-year update for the LWC

Plan. The following model items will be completed after the update of the LWC Plan: calibration, documentation of the models and peer review.

## MINIMUM FLOWS AND LEVELS ACTIVITIES

As part of the process of establishing and maintaining MFLs, the SFWMD is developing and implementing an electronic tracking system to determine whether MFL criteria are being met. Other efforts include producing documents and conducting scientific and peer reviews.

## RESERVATIONS ACTIVITIES

The process of establishing water reservations for resource protection involves preparing documents, conducting scientific peer reviews, holding public workshops and providing administrative support. In some cases, the District assembles a team of experts to assist with analysis, interpretation, and presentation of technical issues and information needed to develop and implement a standardized methodology/approach for water reservations.

## OTHER EFFORTS

Other efforts may be funded by District departments other than Water Supply and could include cofunding by local, state and federal agencies. Several efforts initially cited in the 2000 LWC Plan now fall under the auspices of the Comprehensive Everglades Restoration Plan (CERP) and Acceler8. These projects are discussed in **Chapter 3**.

## SUMMARY

Water Resource Development projects serve various purposes in support of water supply development. The beneficial outcomes of the resource development projects discussed in this chapter include:

- Improved understanding of the hydrologic system that is the source of both traditional and alternative water supplies for the LWC Planning Area.
- Prevention of loss of natural resources.
- Preservation of existing supplies through better resource understanding, and management and implementation of regional resource improvement programs.
- Avoidance of potentially greater future expenditures associated with additional restoration of environmental degradation.

- Cost savings, including those savings associated with appropriate supply facilities design and use of existing resources.
- Increased future supply availability through testing or program implementation.

**Table 7.** Implementation Schedule and Costs for Districtwide Water Resource Development Projects Fiscal Years 2006–2010.

Project	Plan Implementation Schedule and Costs (\$1,000s)					
	FY06	FY07	FY08	FY09	FY10	Total
	\$	\$	\$	\$	\$	\$
<b>Drilling and Testing</b> Est. start date: 1990 Est. finish date: ongoing	1,736	109	115	121	127	2,208
<b>Groundwater and Wetland Monitoring</b> Est. start date: 2002 Est. finish date: ongoing	810	581	610	640	627	3,268
<b>Groundwater and ET Assessments</b> Est. start date: 1954 and 2002, respectively Est. finish date: ongoing	385	270	284	298	313	1,550
<b>Water Conservation Program</b> Est. start date: 1977/2000 Est. finish date: ongoing	1,650	1,248	1,248	1,248	1,248	6,642
<b>Districtwide Feasibility Studies</b> Est. start date: 2001 Est. finish date: ongoing	950	550	600	600	600	3,300
<b>Modeling</b> Est. start date: 1998 Est. finish date: ongoing	100	195	205	215	226	941
<b>MFLs Activities</b> Est. start date: 1995 Est. finish date: ongoing	105	160	200	200	200	865
<b>Reservations Activities</b> Est. start date: 2004 Est. finish date: ongoing	425	195	200	200	200	1,220
<b>Total</b>	\$6,161	\$3,308	\$3,462	\$3,522	\$3,541	\$19,994